

WHAT IS CLAIMED IS:

1. A rotating stream sprinkler, comprising:

5 a rotatable deflector having an underside surface defining an array of vanes and an upper surface defining a radially outwardly inclined ramp;
at least one jet port for directing at least one water jet into engagement with said vanes, said vanes subdividing and redirecting said at least one water jet into a plurality of relatively small water streams projected generally radially outwardly therefrom;

10 a ball drive rotor mounted for rotation relative to said deflector and having at least one radially outwardly open ball track formed therein;

each of said at least one ball track having a drive ball movably carried therein and supported on said inclined ramp, said drive ball having a size and mass for radially outward displacement along said ball track by centrifugal force in response to rotor rotation exceeding a predetermined rotational speed;

15 at least one anvil carried by said deflector for repetitious impact engagement by said drive ball upon rotor rotation exceeding said predetermined rotational speed for rotatably displacing said deflector through a repetitious succession of relatively small rotational step; and

20 a turbine drive arrangement for rotatably driving said rotor at a rotational speed exceeding said predetermined rotational speed.

25 2. The rotating stream sprinkler of claim 1 further including a speed control brake coupled to said deflector and including friction members for resisting rotation of said deflector variably in response to fluctuations in water supply pressure and flow rate to maintain deflector rotational speed substantially constant throughout a normal operating range of water pressures and flow rates.

30 3. The rotating stream sprinkler of claim 1 wherein said array of vanes on said deflector underside surface comprises a plurality of vanes

extending generally upwardly and curving smoothly to extend generally radially outwardly with a selected angle of inclination, said plurality of vanes defining a corresponding plurality of intervening flow channels.

5 4. The rotating stream sprinkler of claim 1 wherein said deflector and said ball drive rotor are supported for rotation about a common axis.

10 5. The rotating stream sprinkler of claim 1 further including a sprinkler base adapted for mounting onto an upper end of a tubular riser adapted in turn for connection to a supply of water under pressure, said base having said deflector and said ball drive rotor rotatably supported thereon, said at least one jet port being formed in said base.

15 6. The rotating stream sprinkler of claim 5 wherein said at least one jet port formed in said base is formed in a predetermined configuration to provide a predetermined pattern of water streams projected outwardly from said deflector.

20 7. The rotating stream sprinkler of claim 1 wherein said at least one ball track formed in said ball drive rotor comprises a plurality of said ball tracks formed generally at equiangularly spaced positions, and further wherein each of said plurality of ball tracks has a respective drive ball carried therein.

25 8. The rotating stream sprinkler of claim 1 wherein said at least one anvil comprises a plurality of anvils carried by said deflector generally at equiangularly spaced positions.

30 9. The rotating stream sprinkler of claim 1 further including a generally cylindrical wall upstanding from the periphery of said deflector upper surface, said at least one anvil protruding radially inwardly from said wall.

10. The rotating stream sprinkler of claim 9 further including a cap plate mounted on said wall and cooperating with said wall and said deflector upper surface to define a substantially closed drive chamber having said rotor and said drive ball contained therein.

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11. The rotating stream sprinkler of claim 1 further including a cap member for retaining said drive ball within said ball track.

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12. The rotating stream sprinkler of claim 1 wherein said turbine drive arrangement comprises a water turbine, a drive shaft rotatably connecting said turbine with said rotor, and a swirl plate having at least one swirl port formed therein for providing a circumferentially swirling water flow for rotatably driving said turbine.

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13. The rotating stream sprinkler of claim 12 wherein said swirl plate and said turbine are mounted upstream relative to said water jet means.

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14. The rotating stream sprinkler of claim 12 further including a bearing sleeve rotatably supporting said drive shaft and having said deflector independently rotatably supported thereon, said bearing sleeve including a radially enlarged thrust flange, and further including a brake pad axially interposed between said thrust flange and a friction surface on said deflector for frictionally resisting deflector rotation.

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15. The rotating stream sprinkler of claim 2 wherein said speed control brake comprises a friction surface on said deflector, a substantially nonrotational brake disk, and a resilient brake pad interposed between said friction surface and said brake disk.

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16. The rotating stream sprinkler of claim 1 further including a flow rate adjustment assembly for variably adjusting water flow to the sprinkler.

17. The rotating stream sprinkler of claim 16 wherein said flow rate adjustment assembly comprises a rotatable adjustment screw, an adjustment nut axially translatable on said screw upon rotation thereof, and a resilient restrictor element having at least one flow channel formed therein, said restrictor element being compressible by said nut upon rotation of said screw for varying the cross sectional size of said at least one flow channel thereby variably throttling water flow to the sprinkler.

18. The rotating stream sprinkler of claim 17 wherein said flow rate adjustment assembly is mounted upstream relative to said turbine drive arrangement.

19. The rotating stream sprinkler of claim 17 further including a generally cup-shaped filter unit having said flow adjustment assembly mounted therein.

20. The rotating stream sprinkler of claim 17 further including means for engaging and rotating said adjustment screw from the exterior of the sprinkler.

21. A rotating stream sprinkler, comprising:
a base adapted for mounting onto an upper end of a tubular riser adapted in turn for connection to a supply of water under pressure;

a deflector rotatably mounted on said base, said deflector having an underside surface defining an array of vanes disposed in spaced relation above said base, said array of vanes extending generally upwardly relative to said base and then curving smoothly to extend generally radially outwardly with a selected angle of inclination, said plurality of vanes defining a corresponding plurality of intervening flow channels, said deflector further including an upper surface defining a radially outwardly inclined ramp;

at least one jet port formed in said base for directing at least one water jet generally upwardly into engagement with said vanes, said vanes

subdividing and redirecting said at least one water jet into a plurality of relatively small water streams projected generally radially outwardly therefrom;

5 a ball drive rotor mounted for rotation relative to said deflector and having at least one radially outwardly open ball track formed therein;

each of said at least one ball track having a drive ball movably carried therein and rollingly supported on said inclined ramp, said drive ball having a size and mass for radially outward displacement along said ball track by centrifugal force in response to rotor rotation exceeding a
10 predetermined rotational speed;

a generally cylindrical wall upstanding from the periphery of said deflector upper surface;

at least one anvil protruding generally radially inwardly from said wall for repetitious impact engagement by said drive ball upon rotor rotation exceeding said predetermined rotational speed for rotatably displacing said
15 deflector through a repetitious succession of relatively small rotational step; and

a turbine drive arrangement for rotatably driving said rotor at a rotational speed exceeding said predetermined rotational speed.
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22. The rotating stream sprinkler of claim 21 further including a speed control brake coupled to said deflector and including friction members for resisting rotation of said deflector variably in response to fluctuations in water supply pressure and flow rate to maintain deflector rotational speed
25 substantially constant throughout a normal operating range of water pressures and flow rates.

23. The rotating stream sprinkler of claim 21 wherein said deflector and said ball drive rotor are supported by said base for rotation about a
30 common axis.

24. The rotating stream sprinkler of claim 21 wherein said turbine drive arrangement comprises a water turbine, and a drive shaft connected between said turbine and said rotor, and further including a bearing sleeve rotatably supporting said drive shaft and carrying said deflector for independent rotation relative to said drive shaft.

25. The rotating stream sprinkler of claim 24 wherein said bearing sleeve further includes a radially enlarged thrust flange, and further including a brake pad axially interposed between said thrust flange and a friction surface on said deflector for frictionally resisting deflector rotation.

26. The rotating stream sprinkler of claim 21 wherein said at least one ball track formed in said ball drive rotor comprises a plurality of said ball tracks formed generally at equiangularly spaced positions, and further wherein each of said plurality of ball tracks has a respective drive ball carried therein.

27. The rotating stream sprinkler of claim 21 wherein said at least one anvil comprises a plurality of anvils carried by said wall generally at equiangularly spaced positions.

28. The rotating stream sprinkler of claim 21 wherein said wall is formed integrally with said deflector.

29. The rotating stream sprinkler of claim 21 further including a cap plate mounted on said wall and cooperating with said wall and said deflector upper surface to define a substantially closed drive chamber having said rotor and said drive ball contained therein.

30. The rotating stream sprinkler of claim 24 wherein said turbine drive arrangement further comprises a swirl plate positioned upstream relative to said at least one jet port, said swirl plate having at least one swirl

port formed therein for providing a circumferentially swirling water flow for rotatably driving said turbine.

5 31. The rotating stream sprinkler of claim 21 further including a flow rate adjustment assembly for variably adjusting water flow to the sprinkler.

10 32. The rotating stream sprinkler of claim 31 wherein said flow rate adjustment assembly comprises a rotatable adjustment screw, an adjustment nut axially translatable on said screw upon rotation thereof, and a resilient restrictor element having at least one flow channel formed therein, said restrictor element being compressible by said nut upon rotation of said screw for varying the cross sectional size of said at least one flow channel thereby variably throttling water flow to the sprinkler.

15 33. The rotating stream sprinkler of claim 32 wherein said turbine drive arrangement comprises a water turbine and a drive shaft connected between said water turbine and said rotor, and further including a cap plate mounted on said wall and cooperating with said wall and said deflector upper surface to define a substantially closed drive chamber having said rotor and said drive ball contained therein, said cap plate having an externally exposed tool slot formed therein and further including at least one key engageable with said rotor for rotatably driving said rotor upon rotation of said cap plate, and said drive shaft having a tool tip engageable with said adjustment screw for rotating said screw, said drive shaft being supported during normal operation with said cap plate key in spaced relation with said rotor and with said tool tip in spaced relation to said adjustment screw, said cap plate being movable axially for engaging said cap plate key with said rotor and for engaging said tool tip with said adjustment screw and thereupon rotatable for
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30 rotatably adjusting said adjustment screw.

34. The rotating stream sprinkler of claim 33 wherein said drive shaft is supported during normal operation by the pressure of water supplied to the sprinkler with said cap plate key in spaced relation with said rotor and with said tool tip in spaced relation to said adjustment screw.

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35. The rotating stream sprinkler of claim 31 wherein said flow rate adjustment assembly is mounted upstream relative to said turbine drive arrangement.

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36. The rotating stream sprinkler of claim 35 further including a generally cup-shaped filter unit having said flow adjustment assembly mounted therein.

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37. A rotating stream sprinkler, comprising:

a rotatable deflector having an underside surface defining an array of vanes and an upper surface defining a radially outwardly inclined ramp;

at least one jet port for directing at least one water jet into engagement with said vanes, said vanes subdividing and redirecting said at least one water jet into a plurality of relatively small water streams projected generally radially outwardly therefrom;

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a drive rotor for rotatably driving said deflector;

a turbine drive arrangement including a turbine, a drive shaft rotatably connecting said turbine with said rotor for rotatably driving said rotor, and a swirl plate having at least one swirl port formed therein for providing a circumferentially swirling water flow for rotatably driving said turbine; and

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a flow rate adjustment assembly for variably adjusting water flow to the sprinkler, said flow rate adjustment assembly including a rotatable adjustment screw, an adjustment nut axially translatable on said screw upon rotation thereof, and a resilient restrictor element having at least one flow channel formed therein, said restrictor element being compressible by said

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nut upon rotation of said screw for varying the cross sectional size of said at least one flow channel thereby variably throttling water flow to the sprinkler;

said drive shaft further including a tool member engageable with said adjustment screw for rotatably adjusting said screw, said drive shaft being axially movable between a first position with said tool member is spaced relation with said adjustment screw and a second position with said tool member engaged with said adjustment screw, said drive shaft being normally supported in said first position during normal operation by the pressure of water supplied to the sprinkler.

38. The rotating stream sprinkler of claim 37 wherein said flow rate adjustment assembly is mounted upstream relative to said turbine drive arrangement.

39. The rotating stream sprinkler of claim 37 further including a speed control brake coupled to said deflector and including friction members for resisting rotation of said deflector variably in response to fluctuations in water supply pressure and flow rate to maintain deflector rotational speed substantially constant throughout a normal operating range of water pressures and flow rates, said friction members being engaged when said drive shaft is in said first position and disengaged when said drive shaft is in said second position.

40. The rotating stream sprinkler of claim 37 further including a cap plate mounted on said deflector, said cap plate being movable axially for engaging and shifting said drive shaft from said first position to said second position, said cap plate further including at least one key engageable with at least one keyway formed in said rotor for rotatably driving said rotor upon rotation of said cap plate when said drive shaft is in said second position, for rotatably driving said adjustment screw.

41. The rotating stream sprinkler of claim 40 wherein said cap plate has an externally exposed tool slot formed therein.

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